

Appln No. 10/665,304
Amdt date November 22, 2006
Reply to Office action of August 24, 2006

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Please cancel claims 40-49, and amend claims 1, 5, 25 and 28 as follows:

1. (Currently Amended) A method of manufacturing a cutting element comprising:
selecting an ultra hard material which is not fully densified;
selecting a substrate at least a portion of which has a density that is less than 100% of full density of said at least a portion;
placing the ultra hard material over the substrate; and
sintering the resulting assembly of substrate and ultra-hard material at a sufficient temperature and pressure for full densification and metallurgical joining of the substrate and ultra[(-)]hard material, wherein the ultra hard material shrinks during sintering, and wherein the density is selected for [reducing a constraint provided by the substrate on the ultra hard material shrinkage during sintering] providing a desired level of constraint by the substrate to the ultra hard material shrinkage during sintering.
2. (Previously Presented) A method as recited in claim 1 wherein a first portion of the substrate has said density and a second portion of the substrate is fully densified prior to sintering.
3. (Previously Presented) A method as recited in claim 2 wherein said substrate first portion extends over the second portion and wherein the ultra hard material layer is placed over the first portion.
4. (Canceled)

5. (Currently Amended) A method as recited in claim 1 wherein selecting a substrate comprises selecting a substrate comprising an outer portion surrounding an inner portion, wherein ~~[[an]]~~ the outer portion of the substrate has a density less than 100% of full density of said outer portion and ~~[[an]]~~ the inner portion of the substrate is fully densified.

6. (Previously Presented) A method as recited in claim 1 wherein selecting a substrate comprises selecting a substrate wherein a first portion of the substrate has a first density and wherein a second portion of the substrate has a second density, wherein the first density is different from the second density.

7. (Previously Presented) A method as recited in claim 1 wherein selecting a substrate comprises selecting a substrate wherein the entire substrate has a density less than 100% of full density of the substrate.

8. (Previously Presented) A method as recited in claim 1 wherein selecting a substrate comprises selecting a substrate wherein said at least a portion has a density in the range of about 70% to about 90% of full density of said portion.

9. (Previously Presented) A method as recited in claim 1 wherein selecting a substrate comprises selecting a substrate wherein said at least a portion has a density in the range of about 40% to about 99% of full density of said portion.

10. (Previously Presented) A method as recited in claim 9 wherein selecting a substrate comprises selecting a substrate wherein said at least a portion has a density in the range of about 75% to about 99% of full density of said portion.

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11. (Previously Presented) A method as recited in claim 1 wherein selecting a substrate comprises selecting a substrate wherein the substrate prior to sintering has a porosity of in the range of about 1% to about 30%.

12. (Original) A method as recited in claim 1 further comprising forming a non-uniform face on the substrate material, wherein the ultra hard material is placed over the non-uniform face.

13. (Canceled)

14. (Canceled)

15. (Canceled)

16. (Canceled)

17. (Canceled)

18. (Canceled)

19. (Canceled)

20. (Canceled)

21. (Canceled)

22. (Canceled)

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23. (Canceled)
24. (Canceled)
25. (Currently Amended) A method of manufacturing a cutting element comprising:
selecting an ultra hard material which is not fully densified;
selecting a substrate having a first portion that has a first density less than 100% of full density, and a second portion that has a second density that is different from the first density;
placing the ultra hard material over the ~~substrate material~~ substrate; and
processing the resulting assembly of substrate and ultra hard ~~materials~~ material at a sufficient temperature and pressure for full densification and metallurgical joining of the substrate and ultra hard material, wherein the ultra hard material shrinks during sintering, and wherein the densities of the two portions are [chosen to reduce a constraint to the ultra hard material shrinkage provided by the substrate during sintering] selected for providing a desired level of constraint by the substrate to the ultra hard material shrinkage during sintering.
26. (Original) A method as recited in claim 25 wherein the first density is in the range of about 70% to about 90% of full density.
27. (Original) A method as recited in claim 25 wherein the first density is in the range of about 40% to about 99% of full density.
28. (Currently Amended) A method as recited in claim 27[[.]] wherein the first density is in the range of about 75% to about 99% of full density.
29. (Original) A method as recited in claim 25 wherein the first density is in the range of about 40% to about 70% of full density.

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30. (Original) A method as recited in claim 25 wherein the substrate prior to sintering has a porosity of in the range of about 1% to about 30%.

31. (Original) A method as recited in claim 25 further comprising forming a non-uniform face on the substrate material, wherein the ultra hard material is placed over the non-uniform face.

32. (Previously Presented) A method as recited in claim 25 wherein the second density is 100% of full density.

33. (Original) A method as recited in claim 25 wherein first and second densities are selected for controlling the magnitude of the residual stresses generated on the ultra hard material layer during sintering.

34. (Previously Presented) A method as recited in claim 1 wherein the density is selected to minimize the constraint provided by the substrate to the ultra hard material shrinkage during sintering.

35. (Previously Presented) A method as recited in claim 1 wherein the substrate and the ultra hard material shrink during sintering and wherein the density is selected to minimize shrinkage difference between the substrate and the ultra hard material during sintering.

36. (Previously Presented) A method as recited in claim 1 wherein the ultra hard material comprises diamond.

37. (Previously Presented) A method as recited in claim 25 wherein the densities are selected to minimize the constraint provided by the substrate to the ultra hard material during sintering.

38. (Previously Presented) A method as recited in claim 25 wherein the substrate and the ultra hard material shrink during sintering and wherein the densities are selected to minimize shrinkage difference between the substrate and the ultra hard material during sintering.

39. (Previously Presented) A method as recited in claim 25 wherein the ultra hard material comprises diamond.

40. (Canceled).

41. (Canceled).

42. (Canceled).

43. (Canceled).

44. (Canceled).

45. (Canceled).

46. (Canceled).

47. (Canceled).

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48. (Canceled).

49. (Canceled).